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(54) Stabilisation of peroxyacids in detergent compositions containing nonionic surfactant

(57) Peroxyacid stability in detergent compositions is assisted by adsorbing the nonionic surfactant onto smectite clays or pre-dried zeolites, to form particulate bodies which can then be mixed with the particulate peroxyacid. Suitable clays are sodium montmorillonite, and the hydrous magnesium silicates under the trademark "LAPONITE."

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## SPECIFICATION

## Stabilisation of peroxyacids

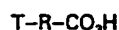
- 5 The present invention relates to the stabilisation of peroxyacids in compositions containing them, and more specifically to their stabilisation in the presence of nonionic surfactants. 5
- Many particulate washing compositions or bleach additive compositions have contained a peroxygen compound as bleach. For many years, when it was common household washing practice to bring wash liquors to boiling point, the peroxygen compound has typically been a 10 persalt such as sodium perborate (tetrahydrate or monohydrate) or sodium percarbonate. Those compounds are very effective bleaches at elevated washing temperatures but become less effective at the hand hot temperatures that are now being employed to a greater extent in view of changes in household fabrics, the finishes to them and the cost of heating water. In consequence, alternative peroxygen compounds have been sought that are more active at lower wash 15 temperatures of which one important class comprises organic peroxyacids. Whilst it has been known that some peroxyacids are inherently more stable than others whilst in storage in particulate washing compositions, it has now been found also that a contributory factor in the destabilisation of even the most inherently stable peroxyacids is the presence of nonionic surfactants, common constituents of such compositions. 15
- 20 Accordingly, it is an object of the present invention to ameliorate the problem of nonionic surfactant-induced organic peroxyacid destabilisation. 20
- According to the present invention there is provided a process for stabilising an organic peroxyacid in a nonionic surfactant-containing composition in which the nonionic surfactant is at least partly adsorbed by a particulate smectite clay or dried zeolite prior to its incorporation in 25 the composition. 25
- According to further aspects of the invention there are also provided bodies suitable for incorporation in particulate peroxyacid-containing compositions comprising a nonionic surfactant adsorbed on a particulate smectite clay or dried zeolite and compositions containing both a particulate peroxyacid and the aforementioned particulate bodies.
- 30 By the term smectite clay herein is meant clay minerals that are structurally derived intermediates between pyrophyllite  $\text{SigAl}_2\text{O}_{20}(\text{OH})_4$  and talc  $(\text{SigMg}_6\text{O}_{20}(\text{OH})_4)$ . In particular, the term encompasses montmorillonites and hectorites, with reference especially to alkali metal or alkaline earth metal montmorillonites or hectorites. It will be understood that herein naturally occurring 35 clays which comprise mainly montmorillonite and/or hectorite, such as bentonite or fuller's earth can be readily employed in the instant invention process and compositions. Both swelling (i.e. high sodium) and non swelling (i.e. high calcium/magnesium) clays can be employed, and the latter may also have been acid treated to yield activated clay. It is especially suitable to employ substantially pure synthetic hydrous magnesium silicates (hectorites) available from Laporte Industries Limited under their own Trademark LAPONITE. Another eminently suitable clay a sodium 40 montmorillonite is available under the trade mark VOLCLAY. The use of sodium or other alkali metal clays having a high calcium ion exchange capacity that enables the clay to act as a detergent builder in a washing solution is of particular value since it enables the surfactant carrier to perform a second useful role in any composition containing it. It has been found advantageous to pre-dry the clays before contacting them with the nonionic surfactants, especially 45 employing a temperature at around or slightly above  $100^\circ$ , such as up to  $120^\circ\text{C}$ . The effect of such drying is to remove free water from the clays advantageously to below 2% w/w of the clay, and it may also encourage some activation. 45
- The second class of inorganic materials employed herein as adsorbant for the nonionic surfactant comprises zeolites, of which representative examples are zeolites A, X and Y and in 50 particular the zeolites when in sodium form. Such zeolites are readily available in commerce. The various suitable crystalline zeolites and their characteristics are described in 'Zeolite Molecular Sieves' by Donald W. Beck published in 1974 by John Wiley and Sons. The reason why it is sensible to subject any zeolites to a prior drying stage as indicated for the clays, is that in the absence of a drying stage, adsorption of nonionic surfactant onto it can even accelerate the 55 decomposition of any organic peracid mixed with the zeolite/surfactant bodies. It is advantageous to select any crystalline zeolites which are or have hitherto been recommended for use as detergent builders, that is to say have comparatively high calcium ion exchange capacity, since thereby the zeolite can provide a peracid stabilising role during storage and a builder role in use, enabling at least partial replacement of phosphate or other builders to occur. In that 60 context, therefore, zeolites of formula  $\text{Na}_{12}(\text{AlO}_2)_{12}(\text{SiO}_2)_{12} \cdot 20-30 \text{ H}_2\text{O}$  before drying are also useful. 60
- It is desirable to employ the adsorbent in fine powder form, and by way of example the powder is typically less than 1mm diameter, and preferably the greater part is below 0.8mm.
- The invention is applicable to any nonionic surfactant that is intended to be incorporated in a 65 washing composition or bleach additive containing a peracid/detergent. The majority of such 65

surfactants are condensates of polyethylene oxide and/or other alkylene oxides such as propylene oxide with one or more hydrophobic moieties via an ether, ester, amino or amido linkage, i.e. by reaction with fatty alcohols, fatty acids, fatty amines and fatty amides. Fatty implies a carbon chain usually of at least 10 linear carbon atoms and often from 12 to 20. The number of ethylene oxide or other alkylene oxide units in the hydrophilic moiety is usually at least 3, often not in excess of 50, and in many instances is from 6 to 15 units on average. In a related class, the nonionic surfactant can comprise alkyl phenol or alkyl naphthol condensed with polyethylene oxide, in which the alkyl group usually comprises 6 to 12 linear carbon atoms, and at least 7, often 8 to 20 ethylene oxide units are employed. A further class of nonionic surfactants comprises fatty acid alkanolamides, and in particular mono or di ethanolamides and propanolamides.

The weight ratio of nonionic surfactant adsorbed by the smectite clay or zeolite is preferably less than that amount which leaves a sticky surface which would result in caking of the washing composition or bleach additive. The maximum amount for any combination of substrate and adsorbate varies depending especially on the nature and extent of pre-drying of the substrate, and can also depend on the physical size of adsorbate molecule. For many of the clays and zeolites the maximum preferred amount is to be found in the region of 30-45% by weight of the resultant bodies. Accordingly, various suitable bodies have the following compositions :-

- a) Montmorillonite 63-75% w/w  
nonionic surfactant 37-25% w/w
- b) dried montmorillonite 75-83% w/w  
nonionic surfactant 25-17% w/w
- c) 'LAPONITE' hectorite 57-70%  
nonionic surfactant 43-30%
- d) dried zeolite 80-85%  
nonionic surfactant 20-15%

Any solid organic peracid or salt can be employed in the instant invention, but it must be recognised that the improvement in storage stability obtained relates to any instability caused by interaction with the nonionic surfactant and not to the inherent stability or otherwise of the organic peracid. Most of the peroxyacids obey the general formula :-



in which R represents an alkylene group or an arylene group and T represents hydrogen or  $-CO_2M$ ,  $-CO_2M$  or  $-SO_3M$  in which M represents hydrogen or an alkali or alkaline earth metal. When R is aliphatic and T is hydrogen, R preferably contains 9 to 20 linear carbon atoms and when T is anything else R preferably contains 4 to 14 linear carbon atoms. Representative aliphatic peracids when T represents H include peroxydecanoic acid, and peroxydodecanoic acid, and when T represents  $-CO_2H$  or  $CO_2H$  respectively mono and di peroxy azelaic or dodecandioic acids, the diperoxy acids being abbreviated to DPA and DPDA. When R is arylene, the benzene nucleus can be unsubstituted, other than with the single  $-CO_2H$  group, or be substituted with a non-interfering group such as  $C_1$  to  $C_{20}$  alkyl, chloro or nitro groups, or a further carboxylic acid, peroxycarboxylic acid or sulphonic acid group or salt thereof. Examples of aromatic peracids include diperoxy isophthalic acid, monoperoxyphthalic acid and in particular the hydrated magnesium salt thereof (MMPP), 3-chloroperoxybenzoic acid and magnesium bis(3-chloroperoxybenzoate) and the monopotassium salt of 4-sulphoperoxybenzoic acid (KSPB).

It is especially desirable to employ peroxyacids or salts which have comparatively good inherent stability and these include MMPP, KSPB, DPA and DPDA.

The nonionic surfactant can be adsorbed on the clay or dried zeolite particles using a variety of techniques. In the simplest ways, the nonionic surfactant is agitated with the clay/zeolite particles at ambient temperature until it is apparent that the surfactant has been adsorbed. On a small scale this can be effected by gradually introducing more adsorbant into an agitated mixture, but on a large scale it is preferable to predetermine the relative amounts to use by using a small scale trial. Variations on the simple method can be employed, if desired, in which the surfactant, if solid at ambient temperature, is melted and the melt then mixed thoroughly with either preheated clay/zeolite whereby substantially complete adsorption can occur readily, or the entire mixture be heated to maintain that temperature, or alternatively the particles of clay/zeolite can be introduced cold whereby some of the surfactant can remain as a coating. Secondly, the surfactant can be introduced in a solvent preferably nonaqueous which is subsequently evaporated away. Whichever variation is used, though, the essential feature of the invention is that the surfactant is preadsorbed onto the clay/zeolite before being incorporated into the powder peroxyacid composition. Especially when at a larger scale, the surfactant after any necessary liquifaction by heating or dissolution can be sprayed into the clay or zeolite particles suitably agitated in a chamber by an inert fluidising gas such as air or by a vibrating pan surface or by a rotating inclined surface or drum. In a further technique, the surfactant and

adsorbant can be mixed as a slurry which is then spray dried by conventional apparatus.

The compositions can contain the peroxyacid and the surfactant/adsorbant bodies in any weight ratio at the discretion of the user. For many applications though, the weight ratio can be selected in the range of 5:1 to 1:20 peroxyacid: surfactant/adsorbant bodies, and to deliver into a washing solution efficacious amounts of both peroxyacid and surfactant, the ratio is often conveniently in the range 1:1 to 1:5.

Mixtures of the solid peroxyacid and surfactant bodies can be employed as such as bleaching compositions providing a lower than usual washing solution pH or alternatively they can be used as bleach additive compositions which are added to washing compositions at the point of use.

Alternatively they can be incorporated directly in powder heavy duty detergent compositions. It will be recognised therefore that there is considerable overlap in function between the three aforementioned names for the compositions, and that the differences between them derive often from the omission of anionic surfactant and possibly detergent builders.

Bleaching or bleach additive compositions of the present invention often comprise from 0.5% to 50% w/w peroxyacid, from 99.5% to 40% w/w nonionic surfactant/adsorbant bodies and can also contain, if desired, a diluent up to 70% w/w of the composition. The diluent can be chosen from builders and processing aids detailed subsequently herein.

Washing compositions according to the present invention often contain 0.2 to 40% w/w peroxyacid, particularly 0.5 to 10% w/w, from 5 to 95% w/w surfactant of which at least part is provided in the form of nonionic surfactant adsorbed as herein described on a smectite clay or dried zeolite, and often from 5 to 40% w/w surfactant, from 0 to 90% builder, from 0 to 40% filler or processing aid, from 0 to 40% persalt, and from 0 to 20% in total of detergent auxiliaries.

The surfactants which can be employed in washing compositions according to the present invention or in conjunction with bleaching compositions according to the present invention can be nonionic and anionic, cationic or amphoteric. Generally, the surfactants contain at least one hydrophobic group, e.g. an aliphatic hydrocarbon group containing at least 8 carbon atoms, and often from 10 to 26 carbon atoms, the aliphatic group often being acyclic, but sometimes containing an alicyclic group, or the hydrophobic group can be an alkaryl group containing at least 6 and preferably up to 18 aliphatic carbon atoms. The surfactant contains in addition at least one water-solubilising group for example in anionic surfactants, it can be a sulphonate, sulphate, or carboxylic group which is linked either directly or indirectly to the hydrophobic group, and in nonionic surfactants it can be a poly(oxyethylene) chain. Linking members can include residues of polyhydric alcohols containing etheric or esteric linkages, for example derived from ethylene glycol, propylene glycol, glycerine or polyether residues. The surfactants can be soaps or be synthetic, for example as described in chapter 2 of Synthetic Detergents by A. Davidsohn and B.M. Mildwidsky, 5th Edition published in 1972 by Leonard Hill, London, and methods of making them are described in chapter 4 of the same book.

Amongst anionic surfactants described on pages 15-23 of the aforementioned book, sulphonates and sulphates are of special practical importance. The sulphonates include, for example, alkaryl sulphonates, and particularly alkyl benzene sulphonates, the alkyl group preferably being straight chain containing 9 to 15 carbon atoms, of which one of the most commonly employed surfactants is linear dodecyl benzene sulphonate. Other anionic sulphonates which are useful in washing compositions include olefin sulphonates, obtained, for example, by sulphonating primary or secondary aliphatic mono-olefins, alkene sulphonates, especially linear alkene sulphonates, and hydroxy alkene sulphonates and disulphonates, especially 3-, 4-, and 5-hydroxy-n-alkyl sulphonates in which the alkyl group contains any even number from 10 to 24 carbon atoms. Other desirable anionic surfactants include alcohol sulphates, preferably linear, having a chain length of at least 10 carbon atoms and sulphated fatty acid alkanolamides. Other sulphates comprise sulphated nonionic surfactants as for example alkylphenyl-ethylene oxide ether sulphate in which the alkyl groups contain from about 8 to 12 carbon atoms and there are 1 to 10 units of ethylene oxide in each molecule. Yet other sulphate surfactants comprise alkyl ether sulphates, where the alkyl group contains from 10 to 20 carbon atoms, preferably linearly and each molecule contains from 1 to 10 preferably from 1 to 4 molecules of ethylene oxide. Further anionic surfactants include phosphate derivatives of the ethylene oxide based nonionic surfactants described herein.

In practice, cationic detergents are normally not present in the same composition as anionic surfactants, but when cationic detergents are used they are frequently quaternary ammonium salts such as tetraalkyl ammonium halides in which at least one of the alkyl group contains at least 10 carbon atoms or quaternary pyridinium salts substituted by an alkyl chain of at least 10 carbon atoms.

The nonionic surfactants usable herein have been described hereinbefore.

The nonionic and anionic surfactants are often employed together in many cases in a weight ratio within the range 2:1 to 1:10.

Useful amphoterics surfactants include derivatives of aliphatic quaternary ammonium, sulphonium

and phosphonium compounds in which the aliphatic moieties can be linear or branched, or two of which can join to form a cyclic compound, provided that at least one of the constituents comprises or contains a hydrophobic group containing from about 8 to 22 carbon atoms and the compound also contains an anionic water solubilising group, often selected from carboxylic, sulphate and sulphonates.

- The builders, sometimes elsewhere alternatively called detergent builders or builder salts, which can be included in the washing compositions of the present invention can be either inorganic or organic and water-soluble or insoluble. Suitable inorganic builders are water-soluble include pyrophosphates, triphosphates, and higher polymeric phosphates, having the formula  $\text{Na}_2\text{P}_2\text{O}_7(\text{MPO}_3)_n$ , where M represents an alkali metal cation and n is at least two. Other highly satisfactory inorganic builders include aluminosilicates which can act as cation exchangers for calcium and magnesium cations. Particularly suitable examples of aluminosilicates are zeolite A, characterised in USP 2 882 243, zeolite X characterised in USP 3013 990 and mixtures of A and X, preferably in a weight ratio of 50:50 to 15:35 and the zeolites disclosed in USP 3985 669. Other suitable inorganic builders include tetraborates, carbonates, bicarbonates and silicates. As is conventional, the inorganic builders are preferably in the form of the sodium salt. It will be recognised that the zeolites usable as builders also can act as adsorbants for the nonionic surfactants. Accordingly, in determining the weight of builder to employ, account can be taken of the weight of zeolite used as adsorbant.
- The organic builders which are suitable for inclusion in washing compositions herein include hydroxycarboxylic acids, polycarboxylic acids, aminopoly carboxylic acids and polyphosphonic acids, it being recognised that, as with inorganic builders, the organic builders are normally employed in the form of the sodium salt thereof. It will be recognised that several of the builders could be ascribed to more than one of the classes of builders aforementioned. The polycarboxylic acids can be monomeric such as  $\text{C}_2$  to  $\text{C}_{10}$  alpha-omega dicarboxylic acids, or  $\text{C}_3$  to  $\text{C}_8$  acyclic compounds substituted by at least three carboxylic acid groups such as 1,1,3,3-propane tetracarboxylic acid or 1,1,3,3,5,5-pentane-hexacarboxylic acid, or aromatic such as benzene pentacarboxylic acid. Alternatively, the polycarboxylic acid can be polymeric for example the polymers of acrylic acid, hydroxyacrylic acid, or maleic acid alone or copolymerised with one another or with olefinically unsaturated compounds such as ethylene, vinyl alcohol, vinyl methyl ether, vinyl acetate or acrylamide. Other suitable polycarboxylates include so called "ether polycarboxylates" i.e. ethers in which both aliphatic moieties are short chain and each contains one or more carboxylic acid groups, such as oxydiacetic acid, oxydisuccinic acid or carboxymethyloxysuccinic acid. Alternatively the ether group forms part of a five membered oxole or oxolidine group which is substituted by carboxylic acid groups such as a furan tetracarboxylic acid or tetrahydrofuran tetracarboxylic acid.
- By aminopolycarboxylic acid is meant amines that are substituted by a plurality of carboxylic acid groups, especially acetic acid groups and which may contain a plurality of amine nitrogen atoms linked by dimethylene groups. Such compounds include ethylene diaminetetraacetic acid, diethylene triaminepentaacetic acid, nitrilotriacetic acid and their counterparts in which one of the acetic acid groups is replaced by a (2-hydroxyethyl) group.
- The polyphosphonic acids are normally alkyl, amino-, or hydroxyalkyl-polyphosphonic acid such as 1-aminoethane-1,1-diphosphonic acid, 1-amino-1-phenyl-1,1-diphosphonic acid, amino trimethylene-triphosphonic acid, ethylene diamino tetramethylenetetraphosphonic acid, 1-hydroxy ethane-1,1-diphosphonic acid. Related compounds containing one or more carboxylic acid groups can also be employed, such as 1-phosphonoethane-1,2-dicarboxylic acid.
- The organic polycarboxylates, amino carboxylates and polyphosphonates and the corresponding acids are transition metal sequestrants and accordingly it can be beneficial to include a small amount of up to 5% w/w, e.g. 0.1 to 2% w/w together with the inorganic builders, especially in the event that a persalt is present in the composition.
- The builder tends to produce a washing solution in the range of pH 7.5 to pH 10.5. Naturally, the washing composition can also contain auxiliary agents for washing compositions which are known in themselves such as soil anti-redeposition agents, dye transfer inhibitors, optical brightening agents, stabilisers for peroxyacids, corrosion inhibitors, bactericides, dyes, perfumes, foam enhancers, foam inhibitors, absorbents and abrasives. Such auxiliary agents are often present to a total amount of up to 20% by weight of the washing composition, and typically at least 1% and frequently between 1 and 10%.
- By way of example, sodium carboxymethylcellulose is of practical importance as a soil antiredeposition agent, and derivatives of diaminostilbene sulphonic acid and 1,3-diaryl-2-pyrazolines, and aminocoumarins are well known optical brighteners.
- If desired, the washing composition can contain in addition one or more inorganic persalts such as sodium perborate monohydrate, or sodium percarbonate, for example in a mole ratio to peracid of preferably over 1:1 to 5:1. Such a combination can be particularly desirable where the washing composition is dissolved in the washing liquor at ambient temperature and the liquor is then heated to a final washing temperature in excess of 60 to 70°C, the peracid providing an

oxidising bleach at low washing temperatures and the persalt remaining to continue the bleaching at the high washing temperatures. If desired, auxiliaries in the washing compositions of the present invention can include an aldehyde or ketone peroxyacid activator as described in USP 4005 029, e.g. 8-hydroxy quinoline which is also a well known peroxygen stabiliser.

- 5 Washing processes according to the present invention can be carried out at a temperature from ambient up to the boiling point of the washing solution. Compositions according to the present invention are particularly well suited to a process at which washing or bleaching is carried out by steeping at ambient or by heating the solution to a temperature from about 25° to 60°C. Alternatively the washing and bleaching processes may be effected by heating up a cold washing solution. A combination of processes can be used, such as cold steeping followed by a wash at 30, 40 or 50°C. 10

In general, it is desirable for washing or bleaching solutions for use in the home to contain at least 1 part per million available oxygen (Avox) preferably at least 5 parts per million Avox.

- Household washing solutions prepared by dissolution of detergent compositions in general provide no more than about 200 ppm Avox, frequently no more than 100 ppm Avox and in many cases in the range of 25 to 200 ppm Avox. 15

- In general, the rate of removal of stains is enhanced by employing a higher temperature and by higher Avox concentrations. The contact period between solution and fabric can conveniently be as short as 5 minutes. Longer periods of for example, up to 1 hour tend to provide greater soil removal. In cold washing or steeping even longer periods can be employed, such as steeping overnight. 20

- In addition to washing and/or bleaching fabrics, the compositions can be used to clean hard surfaces such as metal, plastic or wooden surfaces, either by dissolving washing or bleaching compositions in water, preferably to provide 200 ppm to 500ppm avox or by forming a slurry or paste of such compositions. Also, if desired, solutions produced by the dissolution of compositions described herein can be used to bleach textile fabrics, wood or pulp bleaching such articles with hydrogen peroxide or inorganic peroxyacids. 25

Having described the invention in general terms, specific embodiments will be described more fully by way of example.

- 30

#### Examples

Examples 1 to 5 and Comparisons 6 and 7

- In these Examples and Comparisons bodies of nonionic surfactant and adsorbant were prepared by stirring into a representative nonionic surfactant (alcohol ethoxylate, ether residue C12-C14, degree of ethoxylation 7) a powdered adsorbant, introduced slowly, until all the surfactant had been taken up by the adsorbant, judged by eye. The resultant products were free-flowing particulate bodies having the compositions summarised by Table 1 below. VOLCLAY and LAPONITE are Trade Marks of respectively Allied Colloids and Laporte Industries Limited. 35

- 40 Table 1

	Adsorbant Type	% wt in bodies	
		Adsorbant	Surfactant
Ex 1	Montmorillonite (detergent grade)	63	37
45 Ex 2	Montmorillonite (detergent grade) predried	76	24
Ex 3	"VOLCLAY"	64	36
Ex 4	Predried zeolite Y	80	20
Ex 5	"LAPONITE" RD	57	43
50 C6	Zeolite Y	67	33
C7	Sodium carbonate	71	29

From Table 1 it can be seen that the adsorbants were able to take up a substantial weight of surfactant.

- 55 Examples 8 to 12 and Comparisons 13 to 15

- In these Examples and Comparisons 13, 14 the bodies produced in the preceding Examples and Comparisons were mixed with a particulate peroxyacid salt, magnesium monoperoxyphthalate hexa-hydrate available from Interlox Chemicals Limited under their trademark Interlox H48. In Comparison 15, the surfactant was present as such, i.e. not preadsorbed onto any substrate. Each mixture contained the nonionic surfactant in a weight ratio to the H48 peroxy acid salt of 1.5:1. The mixtures were then stored at 37°C in "Polybottles" (Trade Mark for polyethylene bottles, 100 ml size) with pinholes in the cap to permit gases to vent off, and the peracid available oxygen was measured periodically by arsenious oxide oxidation followed by back titration with iodine technique. The results after two weeks storage are shown in Table 2 below, computed as % Avox lost, except for C14 which was after 1 week's storage only. 60 65

Table 2

	Product of	% Avox lost	
Ex 8	Ex 1	38	
5 Ex 9	Ex 2	8	5
Ex 10	Ex 3	3	
Ex 11	Ex 4	31	
Ex 12	Ex 5	0	
C13	C6	99	
10 C14	C7	73*	10
C15	not adsorbed	76	

From Table 2, it can be seen that when the nonionic surfactant is preadsorbed onto certain adsorbants, the rate at which available oxygen is lost from the peracid can be reduced, in some instances by a very substantial extent. Thus, by comparing Ex 8 with Ex 9, and Ex 11 with C13, it will be seen that predrying the adsorbant substantially improved the peracid stability when the adsorbant was either the montmorillonite clay or the zeolite. Indeed, in the case of the zeolite the body produced by adsorbing nonionic surfactant onto the non-predried material appeared to accelerate peracid decompositions as can be seen by comparing C13 with C15. Moreover, by comparing C14 with C15 it will be seen also that some substrates which could adsorb a similar amount of nonionic surfactant also accelerated peracid decomposition. On the other hand, very good stability improvement was achieved by adsorbing onto predried montmorillonite and excellent improvement using VOLCLAY and LAPONITE adsorbants.

#### 25 Comparisons 16 and 17

By way of further comparisons, trials were made in which 0.85 parts by weight of the same peracid salt and 0 or 1 part by weight of the adsorbant of Example 5 were simply mixed in particulate form into 5 parts by weight of a detergent composition containing the same nonionic surfactant (20% w/w) and in addition 5% w/w anionic surfactant, 60% w/w sodium tripolyphosphate, 10% w/w sodium silicate, 5% w/w sodium sulphate and 2% detergent auxiliaries including an OBA and SARD. The mixtures were stored at 37°C in pinholed "Polybottles" as in Examples/Comparisons 8 to 15, and the residual avox measured periodically as before. After 4 weeks storage of the "LAPONITE"-free composition, (C16) the peracid had lost 42% of its Avox, whereas in the "LAPONITE"-containing composition (C17) the peracid had lost 43% of its Avox. Both results are so similar that post adding of the adsorbant to the mixture gives no detectable benefit. This result is completely different from when the surfactant was pre-adsorbed into the LAPONITE adsorbant when the Avox loss was reduced from 76% to virtually zero.

#### CLAIMS

- 40 1. A nonionic surfactant-containing composition in which the nonionic surfactant is at least partly adsorbed by a particulate smectite clay or dried zeolite prior to its incorporation in the composition.
2. A process according to claim 1 in which the adsorbant is a montmorillonite or hectorite clay.
- 45 3. A process according to claim 2 in which bodies are formed by the adsorption of 37-25% w/w nonionic surfactant onto 63-75% w/w montmorillonite or 43-30% w/w nonionic surfactant onto 57-70% w/w hectorite.
4. A process according to claim 1 or 2 in which the adsorbant is a pre-dried clay.
5. A process according to claim 4 in which bodies are formed by the adsorption of 25-17% w/w nonionic surfactant onto 75 to 83% w/w pre-dried clay.
- 50 6. A process according to claim 1 in which the zeolite is A, X or Y.
7. A process according to claim 1 or 6 in which bodies are formed by absorbing 20-15% w/w nonionic surfactant onto 80-85% w/w pre-dried zeolite.
8. A process according to any preceding claim in which the clay or zeolite has a high calcium-ion exchange capacity.
- 55 9. A process according to any preceding claim in which a liquid or molten nonionic surfactant is contacted with the particulate adsorbant and agitated until a free-flowing mass is obtained, or the nonionic surfactant is introduced in non-aqueous solution onto the adsorbant and the solvent evaporated off with agitation of the mixture.
- 60 10. A process according to any preceding claim in which the nonionic surfactant is a condensate of polyethylene oxide with a hydrophobic alkyl, aralkyl or alkaryl moiety via an ether, ester, amino or amido linkage.
11. A process according to claim 10 in which the surfactant is a condensate of alkyl phenol or alkyl naphthol or C10-C20 fatty alcohol with polyethylene oxide.
- 65 12. Bodies of nonionic surfactant adsorbed on a particulate smectite or predried zeolite as



described in any preceding claim.

13. A bleaching or bleach additive composition comprising a mixture of bodies according to claim 12 with an organic peroxyacid.

14. A composition according to claim 13 in which the peroxyacid is diperoxyazelaic acid, 5 diperoxydodecanedioic acid, magnesium monoperoxyphthalate hexahydrate, or potassium-4-sulphoperoxybenzoic acid. 5

15. A composition according to claim 13 or 14 and further containing one or more anionic surfactants, and optionally one or more detergent builders, processing aids or detergent auxilia-  
ries.

10 16. A composition according to claim 15 which comprises 0.2 to 40% peroxyacid, 5' to 95% 10 surfactant of which the nonionic part is adsorbed in a smectite clay or predried zeolite, 0 to 90% builder, 0 to 40% processing aid, 0 to 40% persalt and 0 to 20% detergent auxiliaries.

17. Means for stabilising an organic peroxyacid in nonionic surfactant-containing compositions substantially as described herein with respect to any novel feature or novel combination of  
15 features, and compositions containing an organic peroxyacid so stabilised. 15

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